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## THE RELATION OF FIRST YEAR BOTANY TO ADVANCED WORK, WITH REFERENCES TO CERTAIN APPLICATIONS AND BY-PRODUCTS

BY PAUL B. MANN

The present fluid and even kaleidoscopic status of elementary biology in New York City high schools, reminds me forcibly of a bit of doggerel which appeared years ago in Harper's Magazine. A colored man had been exercising his mule in the plantation garden, but an altercation arose between them, resulting in the sudden juxtaposition of Rastus' head with the distal extremity of one of the mule's hind legs. Rastus went to sleep. Later consciousness began to dawn and he sat up and soliloquized in a mournful way, beginning:

"Is dis yuh me, or not me,  
Or hab de Debil got me?"

We will all grant that the world needs men and women of scientific imagination and better viewpoints. "Where there is no vision, the people perish." The march of progress can be checked by observing the scrap heaps along its highway. But one might well be perplexed when one finds any iconoclastic authority throwing bodily to the discard-pile, a vehicle which is having one of the most conspicuous careers in advancing human achievement and aspiration.

I have not only hope, I have faith that even arbitrary action can not finally overthrow biology nor displace it permanently from its position as a science of fundamental values for adolescents, as well as adults.

The most discouraging phase of the present situation in the New York City high schools, it seems to me, is the possibility of a hasty, unpedagogical *ipse dixit*, unsupported by judicial and scientific investigations.

Dr. Josephine Baker, in a recent lecture, spoke of the tremendous need of conserving the Belgian children *now*, from rickets and tuberculosis, if Belgium is to be! We know, but sometimes forget, how truly the structure of the nation of to-

morrow is being builded today. But how can the nation have well rounded and stalwart thinkers in its tomorrow if the educators are given the children (the raw material), and then immediately handicapped not only as to tools but as to methods of development? The men and women who were pupils in such a system, will some day declare the bitterness of such injustice.

Of the many contributions which elementary botany and biology make for advanced courses in the school and for later life, I wish to refer briefly to five.

In the first place, the subject of human reproduction is intimately associated with the highest hopes of humanity, and yet is connected with some of the most sordid problems of the race. The very insistence of the sex problem compels a genuine answer from the schools. That answer must be sound, thorough and immediate. Let me quote a line from a letter just received from a Y. M. C. A. worker in France. "It is our former American interpretation of those two terms [*morale and morality*] that disturbs me in trying to consider what America will feel toward and do for her men who are soon to return to her. Is she going to continue to say that there is no sex problem in life, or is she going to face it squarely and try to solve it?" Those who have studied the problem of presenting sex matters to children and have taught biology, know that to avoid the pitfalls there must be a natural and unforced approach. There is absolutely no substitute for the normal, logical procedure of our elementary biology courses, dealing first with fertilization in the flowering plants, then in a typical animal like the fish or the frog. Neither of these topics when presented is tied up with sex-hygiene, there is no self-consciousness, and there is built up a natural foundation for all later applications, whether of sex-hygiene of one sort or another, or the justifiable expectations of the instructor in advanced botany or zoölogy.

In the second place, the stress given to hygiene, now continued throughout the entire high school course, might lead some to a presumption that elementary biology could fairly be dispensed with, in view of the probable(?) duplication of subject matter and treatment. However, the situation is far from being

so palpable. There need be little duplication. In addition, since the hygiene is largely deductive, it presupposes thorough grounding in biologic principles and bases. Military autocracy can be exemplified by the lines "Theirs not to reason why," but the full coöperation of the average hygiene student, and indeed every adult as well, in health endeavors as in other lines of action, is gained not only by knowing that "there's a reason," but knowing what that reason is. First year biology supplies abundant reasons. There is neither time, with only one hygiene period a week, at the most, nor is there continuity enough possible, to teach the content of a full year of biology by means of such a hygiene subterfuge. Daily contact with the experimental evidence of the laboratory is requisite for mental digestion and assimilation of principles, and to develop the scientific viewpoint. Last term, for instance, one of my hygiene classes had to be excused from one week's recitation on account of a holiday, and the next week did not recite for another reason. That meant that they went three weeks without a single recitation!

Nor is there much encouragement for the man who feels on the other hand that general science presents enough biology to be a worthy substitute. I shall not enter into the relative merits of these two subjects. Each has its place. However, the amount of biology presented in a year of general science is too frequently insignificant.

In the third place, have we any moral right to deprive students of the cultural values which are unquestioned by-products of elementary biology? Whatever philosophy of life each student comes eventually to formulate, early or later, will hinge on living things and their relation to metaphysical questions. The drama of life is unbalanced and ill-proportioned if viewed through anthropocentric lenses. Literature is full of references to nature. Shall we send our pupils out into the world, into nature itself, refusing them the key to the interpretations of biologic phenomena? For each student, is due at least the opportunity of an esthetic appreciation of the wonder of life and of the utility and beauty of its types, whether diatom or humming bird, scaled mosaic from a butterfly's wing or the

perfect spiral of the chambered nautilus. In this connection, Professor Curtis writes as follows:\* “The writer remembers how when a student he was taken by the ‘Mosquito-Malaria Theory,’ as it was then called; and at a later date the esthetic appreciation with which he contemplated the apparent explanation of Mendelian segregation and of the determination of sex in terms of the behavior of chromosomes. In spite of uncertainties and the need for further investigation, one felt himself gazing at a picture near enough completion to show what it might become—a sequence so wonderfully ordered as to call forth an esthetic fervor.”

Then again, how without studying elementary botany, can we count on an intelligent citizenry, a citizenry personally interested in forest conservation, individual, municipal, national and inter-national nutrition, including problems of soil fertility, crop production, plant diseases and insect pests, improved methods of transportation and preservation of foods, selection and utilization of proper woods, and a host of related problems, such as the substitution of kelp as a potash source, the ascertaining of new plants yielding rubber, etc., not to speak of applied bacteriology and commercial products. The balance of the year of biology includes the bases for the conservation of fishes, birds and other wild life and the economic relations of hundreds of animal types, from parasites to makers of silk, producers of fur, buttons, oil and so forth, together with an intelligent appreciation of rational living for humans, themselves.

The significance of botanical training has been lately tested in a large way. We know how thousands of boys and girls sprang with avidity to the gardens and farms of the nation, during the past two years, and applied there the laboratory methods of their botany and biology courses. Furthermore, they were trained and ready to interpret the dietetic problems for the rest of the family and thus they kept up the family morale by doing their full share in emphasizing all phases of Hooverizing.

Then there are legislative opportunities. For instance, to refer to only one example among many, last year we needed

\* Science, June 14, 1918.

intelligent legislators, with biological training to pass the Week's Bill, prohibiting the uninspected importation of nursery stock into the United States, and thereby preventing the introduction of plant diseases and obnoxious insects. New bills of biological import will continue to be introduced at Washington and in the state legislatures and there will be even more call for their intelligent consideration. Shall we turn back the hands of the clock and parallel the situation in Pennsylvania in 1885, when an unbiologic legislature spent in hawk bounties, directly and indirectly, nearly \$4,000,000 to save a paltry \$1,875 worth of poultry?

Finally every one recognizes the growing emphasis that the latest decade has given scientific achievement and progress. This appreciation has been reflected in many ways. From a botanical standpoint alone, professional activities have had to grow by leaps and bounds, in order to keep pace with the demands of the hour. Forestry has expanded into a ranking science, the Bureau of Plant Industry has had to continuously increase its staff, plant pathologists are called upon daily to save thousands of dollars' worth of plants by prophylaxis or treatment, pharmaceutical stations have been inaugurated, new plants are being originated by scientific breeding, the Office of Foreign Seed and Plant Introduction have brought to us valuable exotics and have also raised the bars of quarantine against "undesirable" foreign plants, physiological chemists and bio-chemists are everywhere at work on problems of soil fertility, fabric utilization, by-products of plant origin, and the like. Yet I have merely suggested some of the types of botanical activity, without reference to even a complete resumé.

Some of us may not realize the extent to which the national government and the states have fostered the development of the agencies calculated to answer the agricultural demands of this country.

In one of the weekly news letters of last summer, Secretary Houston, of the Department of Agriculture, pointed out that there are 67 agricultural land grant colleges and experiment stations in the United States, with an equipment of \$195,000,000,

a teaching staff of 5,900 and a resident student body of over 75,000.

On May 15, 1862, Abraham Lincoln signed the act, creating the great Department of Agriculture. In the 57 years intervening, there has never been a time when the country at large has been so appreciative, as at present, of the value of this department, nor so cheerfully contemplates the expenditure of approximately \$65,000,000 for its supporting annual budget, to maintain its staff of more than 20,000 people.

Furthermore, on May 8, 1919, there was enacted the Extension Act, which provides that all extension and demonstration work shall be coördinated and carried on coöperatively by the state colleges of agriculture and the Federal Department of Agriculture. After 1922, there will be available approximately \$8,700,000 for the support of this Act. The field work in each state is supervised by a director of extension and is done by (1) men county agents, (2) women county agents, (3) boys' and girls' clubs, (4) corps of specialists.\*

If, as Professor Ames† and many others contend, the war was really won by science, either pure or applied, then there is an everlasting debt which humanity owes to the men of science: the physicians, engineers, sanitarians, meteorologists, geologists, botanists, zoölogists, physicists and chemists. Their service sustained the world at the time of its greatest need. What I want to emphasize is that the careers of these men and women were made possible to them and to the country by their courses in the high school period of their education, when they were self-discovered and when they unquestionably got the trend for their particular vocation.

Shall we not continue to need trained botanists, not to speak of other biologists? Let us keep *wide open* the door marked "Biologic Science" and let *all* the students of our high schools have an unobstructed view of whatever perspectives and vistas they can see.

This then is what I have attempted to present:

\* Weekly News Letter of Department of Agriculture.

† Science, Oct. 25, 1918.

First, the imperative need of a natural biologic approach for the presentation of rational sex hygiene.

Second, the weakness of the attempt to teach hygiene without previous biology foundation, also the impossibility of successfully substituting either hygiene or general science for biology.

Third, the moral demand upon us to supply through biology courses, the working material for individual culture and philosophy.

Fourth, the necessity of popular biologic education to insure worthy legislation.

Fifth, the loss to the country and to the individual concerned, of not discovering those whose talents and genius lie in the line of biologic heritage.

EVANDER CHILDS HIGH SCHOOL,  
NEW YORK CITY.

## REVIEWS

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The larger "Winter Botany" much surpasses any existing work as a practical means of identifying cultivated trees and shrubs in

\* Trelease, William. *Plant Materials for Decorative Gardening. The Woody Plants.* Pp. 204. 1917. Price, \$1.00.

*Winter Botany.* A companion volume to the above. Pp. xi + 394. Illustrated. 1918. Price, \$2.50. Both published by the author, Urbana, Ill.